

## **HR-217 Reducing the Adverse Effects of Transverse Cracking**

**Key Words:** ACC, Transverse cracking, Crack prevention

### **ABSTRACT**

One of the most serious problems of asphalt cement concrete (ACC) pavement today is transverse cracking and subsequent crack deterioration which reduces the effective life of an otherwise structurally sound roadway. Iowa Department of Transportation personnel have been reviewing the frequency of transverse cracking on various asphalt concrete paving projects in recent years. These reviews indicated that the frequency of transverse cracking may be related to the temperature susceptibility of asphalt cement (AC). Dr. Norman W. McLeod has conducted substantial study of stiffness and temperature susceptibility of asphalt cements. Based on this research, Dr. McLeod has established a Pen-Vis Number which is a numeric rating of the temperature susceptibility of asphalt cements.

This research was initiated to identify methods either to reduce the occurrence of transverse cracking or methods to prevent the deterioration of joints sawed to replace the random transverse cracking.

This research was incorporated in to a Jones County asphalt concrete paving project on Iowa 64 from U.S. 151 to the west junction of Iowa 38. Eight (four repetitive) research sections were established to study three variations in the asphalt concrete pavement. The first variation was the comparison of a low and high temperature susceptible AC from two different sources. The second variable was to saw and seal transverse joints at spacings varying from 40 to 100 feet. The third variable was to increase the AC content in the asphalt treated base by one percent. The research sections were constructed with relatively few problems. The general appearance of the asphalt paving in the research area immediately after construction in August, 1980 was good.

Crack and joint surveys have been conducted on all research sections at less than one year intervals since construction. No cracking was identified in any of the research sections after the first winter season. The sawed joints also remained sealed through the first winter. During the second winter season at an age of approximately 1 1/2 years, there was substantial cracking of the high temperature susceptible AC sections and substantial failure of the sealant material in the sawed joints. Evaluation was continued for almost four years after construction. The asphalt pavement constructed with the high temperature susceptible AC produced a crack interval of 35 feet, while the standard construction with the low temperature susceptible AC yielded a crack interval of 170 feet. The low temperature susceptible AC with an increased AC content in the asphalt treated base (ATB) yielded a crack interval of 528 feet.

The Pen-Vis Number is an effective measure of temperature susceptibility of asphalt cements. The frequency of transverse cracking is affected by the temperature susceptibility of the AC. An increased AC content in the ATB also reduces the frequency of transverse cracking.